SOLAR HALO OF FEBRUARY 4, 1904, AT MILWAUKEE, WIS.

By J. W. SCHAFFER, Observer, Weather Bureau, dated February 23, 1904.

This beautiful and interesting optical phenomenon was observed at Milwaukee, Wis., February 2, 1904. When first seen at 10:30 a. m., it appeared exceedingly well defined, and evidently had been visible for some time previous; it lasted with more or less distinctness till noon, then rapidly waned. The solar halo was of 22° radius, and was very distinct; upon the east, west, and north sides were mock suns of unusual brightness. Broad white bands of light extended from the sun to the several parhelia, and also to the southern side of the halo, radiating like the spokes of a wheel. A white band passed through the sun from the east to the west, and was projected around the entire heavens in a complete circumference about 45° from the horizon. At the extreme north point of this band a faint mock sun marked the intersection of some invisible halo. Twenty-two and one-half degrees on either side of this parhelion were two more of much greater brightness.

At the points where the white band left the solar halo, at either side, two tangential arcs appeared convex to the sun; one on the eastern contact with horns turned to the east; one on the western contact with horns turned to the west. A brilliant and highly colored arc, convex side to the sun, was tan-

gent to the solar halo at its upper point between the sun and the zenith and a mock sun appeared at the point of tangency. The most beautiful formation of all was directly in the zenith. This was a halo of 4° radius surrounding the zenith; the half circle toward the sun was composed of the most intense colors and tints which delicately shaded to the northern half and gradually merged into a bright semicircumference. The colors were distinct and brilliant, being more intense than those of the rainbow, and so dazzling that satisfactory inspection could only be made through smoked glasses. In the arrangement of colors the red was on the side toward the sun.

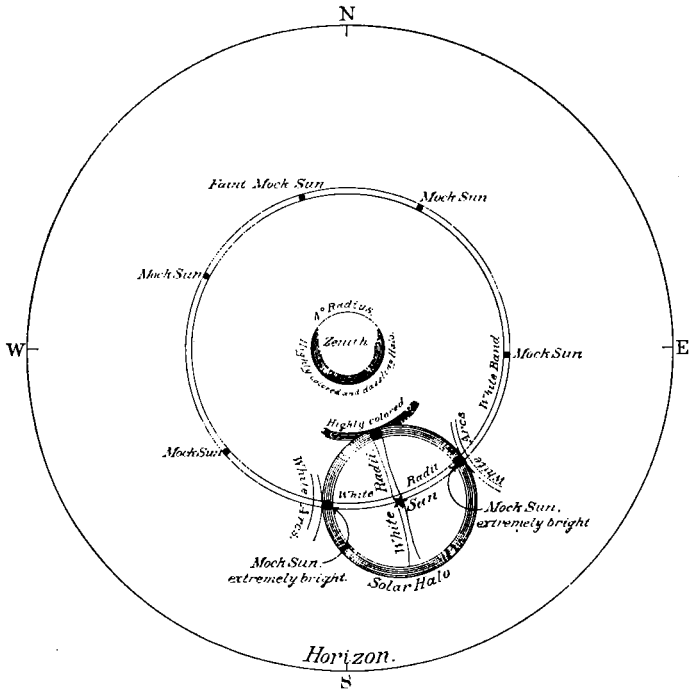

FIG. 1.—Solar halo at Milwaukee, Wis., February 2, 1904.

In a subsequent communication, Mr. Schaeffer adds the following items:

The sun rose February 2 at 7:13, sun time (latitude 43° 2′), and set at 5:13 p. m., making the sun ten hours above the horizon for the entire day. The solar halo was first observed at 9:10 a. m., and was judged to be the ordinary 22° halo. At 9:30 a. m. (or 10:30 a. m., seventy-fifth meridian time), the entire phenomenon was first observed, and continued with unabated distinctness until 12 noon, local time (ninetieth meridian time), then occupied about one-half hour in fading, becoming invisible at about 12:40 p. m. The zenithal halo waned slowly, or occupied about one-half hour, disappearing with the remainder of the phenomenon. The bright spots on either side of the extreme northern parhelion were judged to be about one-sixteenth of a circumference [or 22.5°] from the north point.

A BRIEF DISCUSSION OF CONDITIONS CONTRIBUTING TO FRESHETS IN THE JAMES RIVER WATERSHED.

By EDWARD A. EVANS, Section Director, Richmond, Va., dated July 10, 1903.

No one who has given serious thought to the subject of precipitation and resulting run-off can have failed to perceive that the relationship between them is a variable one; that practically equal quantities of rainfall over the same areas do not always produce equal or even approximately equal flood heights.

In considering the freshets of the James River watershed there are found to be always present certain conditions that affect the run-off. These conditions are divided into two groups, one of which may be designated as permanent, the other changing.

The permanent group comprises:
- Basin topography.
- Immediate stream environments.
- Soil structure.

The changing group consists of:
- Differences in air temperature and moisture.
- Differences in soil temperature and moisture.

The first group represents conditions, the value of which would always be fixed, definite, and unvarying with equal amounts of precipitation were it not for the operations of the factors contained in the second group. These, though permanent in the sense that they are always present, are termed "changing," because they vary constantly in the degree of their application, both with and in the seasons. They prevent a fixed ratio of run-off to precipitation, and for this reason assume a position of high importance in any consideration of questions relating to flood causation or control.

The purpose of this article is to present briefly some information bearing upon each of these groups.

BASIN TOPOGRAPHY.

Beginning with basin topography, a glance at the map of Virginia will show that that part of the James River watershed subject to overflow, and for which flood warnings are issued, fig. 1, extends from the Allegheny Mountains in the central-western portion of the State generally eastward to the head of tidewater at Richmond, a distance of about 263 miles. The greatest width of the watershed is approximately 80 miles, and the least about 5 miles. It consists of two distinct catchment basins which may conveniently be called the upper or mountain, and the lower or middle drainage areas.

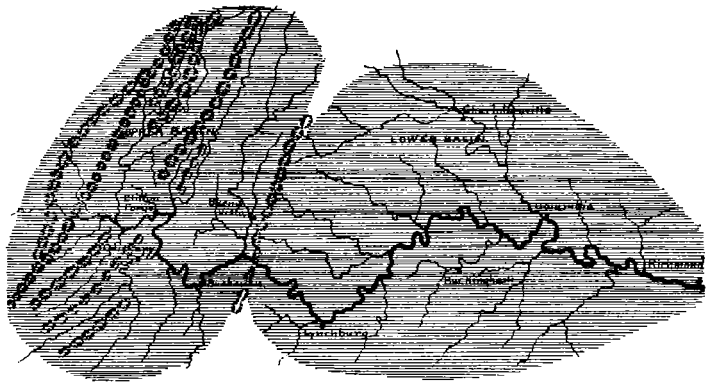

Fig. 1.—James River watershed—Covington to Richmond, Va.

Of these, the upper basin is an oval-shaped depression, the rim of which is composed of the Blue Ridge and the Allegheny mountains on the east and west, respectively, and high intervening uplift of valley lands on the north and south. Its trend is northeast and southwest along the line of its greatest diameter. It has an area of 2058 square miles, and its elevation above sea varies from 706 feet at Balcony Falls, where the James River breaks through the Blue Ridge on its way to the ocean, to about 4000 feet along the western crest of the watershed. In its western parts the surface is broken by numerous ranges of mountains, which lie parallel to the trend of the basin, and as they enter it gradually decrease in elevation until they merge into the high rolling lands of the Shenandoah Valley. These in turn sweep up to the Blue Ridge on the east. A network of branches, creeks, and rivers drain the Shenandoah Valley and the narrow valleys lying between the mountain ranges. Their combined waters enter the James River (which nearly equally bisects the upper basin) either from the northeast on its north side or from the southwest on its south side. These streams are all shallow, rocky, and swift flowing, falling rapidly from their headwaters to their point of junction with the main stream, and having many sinuosities.